

# **INFORMATIONAL LEAFLET NO. 197**

## PRELIMINARY FORECASTS AND PROJECTIONS FOR 1982 ALASKAN SALMON FISHERIES

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## ABSTRACT

More than 111 million salmon were harvested by commercial fishermen in Alaska in 1981. The 1981 catch was the third largest in history, and the seventh consecutive increase since 1974.

An even larger Alaskan commercial salmon harvest is anticipated in 1982. Very strong returns of sockeye and pink salmon are expected to boost the statewide total catch to 135 million fish. This harvest, if realized, would be the highest ever recorded. There is considerable uncertainty associated with the 1982 projection, but the actual harvest is not expected to be below 100 million fish. Based on projection experience since 1970, only 1 of 4 realized harvests would fall below this point. Nine out of ten would be above 85 million.

## INTRODUCTION

This report reviews Alaska's 1981 commercial salmon season and presents preliminary salmon return forecasts and harvest projections for 1982 commercial salmon fisheries. The report is released in December, before final catch figures are available, to provide preliminary information to the Board of Fisheries, the fishing industry, and the public well before the season begins.

Projections of statewide commercial salmon harvests have been published yearly by the Alaska Department of Fish and Game since 1961 (ADF&G; 1969-1981). Table 1 summarizes the accuracy of these projections. On the average, the projections have been too low by 6.4 million fish, or 11% of the average harvest of 59 million fish. Without regard to sign, the mean error is 14 million fish; 24% of the average harvest. Projection errors stem primarily from inadequate knowledge of salmon escapements, numbers of juveniles produced, and early marine survival.

The Department's salmon harvest projections have fallen short of realized harvests every year since 1974, when the statewide salmon catch dropped to 22 million fish. Beginning in 1975, every year's harvest has been an improvement over the last; the 1981 statewide catch of more than 111 million salmon, the seventh consecutive catch increase, was also the largest since 1936. Because of the high natural variability in salmon abundance, and the periodicity inherent in Bristol Bay sockeye and pink salmon returns, persistent harvest trends are rare. In fact, until 1980, there had never been more than five consecutive statewide salmon catch increases, even during the development of Alaskan salmon fisheries near the turn of the century.

Mild winters and generally warmer sea water temperatures are thought to be the major factor behind the higher juvenile salmon survival which has resulted in recent phenomenally high commercial harvests. These very

favorable environmental conditions have worked in tandem with the painstaking fisheries management which insured well-distributed salmon escapements in the early 1970's when salmon returns were weak throughout the state. Pink salmon runs in almost all areas of the state have now rebounded to robust levels. State and private non-profit hatcheries contributed several million salmon to the 111 million-fish 1981 harvest, and these supplemental production sources are becoming increasingly significant.

While it is probably true that fisheries managers and biologists have a natural tendency to be conservative in making harvest projections and forecasts, it should be noted that the largest relative error in the statewide harvest projection was an overestimate. This error occurred in 1972, when a harvest of 47 million salmon was expected, but only 32 million were taken -- a 46% discrepancy. Overestimates exceeding 30% of the actual harvest also occurred in 1970 and 1973. It would be foolhardy to blindly extrapolate the increasing harvest trend set in the 1970's to future years. Assuming average environmental conditions, a more prudent objective is the consolidation and a lessening in the year-to-year variability of Alaska's salmon returns.

#### Glossary

Salmon return or run:	The total number of mature salmon returning in a given year from ocean rearing areas to coastal waters.
Escapement, spawning population or brood stock:	That portion of a salmon run which is not harvested and survives to reach the spawning grounds.
Forecast:	Forecast harvests and returns are estimated using information such as parent-year escapements, subsequent fry abundance, spring sea water temperatures, and escapement requirements.
Harvest projections:	Harvest projections are averages of recent harvests. They may be modified subjectively when qualitative escapement or other relevant information is available. Only harvests are projected, and harvest projections are given only for salmon runs which have no forecast.

Table 1. Projected and realized Alaska commercial salmon harvests with absolute and relative errors, 1970-1981.

Season	Millions of fish			(4) Relative error (% of actual harvest) (3)/(2) X 100%
	(1) Projected harvest	(2) Actual harvest	(3) Error (1) - (2)	
1970	91.5	68.5	23.0	34%
1971	41.5	47.5	-6.0	-13%
1972	46.7	32.0	14.7	46%
1973	30.0	22.3	7.7	35%
1974	15.6	21.9	-6.3	-29%
1975	19.9	26.2	-6.3	-24%
1976	37.1	44.4	-7.3	-16%
1977	34.7	50.8	-16.1	-32%
1978	62.9	81.6	-18.7	-23%
1979	72.0	88.8	-16.8	-19%
1980	102.6	110.0 <sup>1</sup>	-7.4	-7%
1981	74.5	111.4 <sup>1</sup>	-36.9	-33%
TOTAL	629.0	705.4	-76.4 (167.2) <sup>2</sup>	
1970-81 average	52.4	58.8	-6.4 (13.9) <sup>2</sup>	-11% (24%) <sup>2</sup>

<sup>1</sup> Preliminary data. Compiled November 23, 1981.

<sup>2</sup> Values in parentheses are the sum or average of errors without regard to sign.

## Alaska Pacific Salmon Species

<u>Common Name</u>	<u>Scientific Name</u>
chinook, king	<i>Oncorhynchus tshawytscha</i>
sockeye, red	<i>Oncorhynchus nerka</i>
coho, silver	<i>Oncorhynchus kisutch</i>
pink, humpy, humpback	<i>Oncorhynchus gorbuscha</i>
chum, dog	<i>Oncorhynchus keta</i>

Brood years of salmon returning to spawn in 1982, by species and age<sup>1</sup>

Species	Age of Returning Salmon in Years				
	2	3	4	5	6
Pink	1980				
Chum		1979	1978		
Coho		1979	1978		
Sockeye			1978	1977	1976
Chinook			1978	1977	1976

<sup>1</sup> The brood years listed for each species generally comprise more than 90% of the run.

The boundaries of and major fishing areas within the Southeastern, Central, and Western statistical regions are shown in Figure 1. These regions and areas are the ones used in the Department's statistical leaflet series and in prior statistical reports.

### Acknowledgments

Information on which this report is based was contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Area biologists, not individually identified, supplied reviews of the 1981 fishing season. Individual credit for forecast material is given with the area forecast discussions in the Appendix.

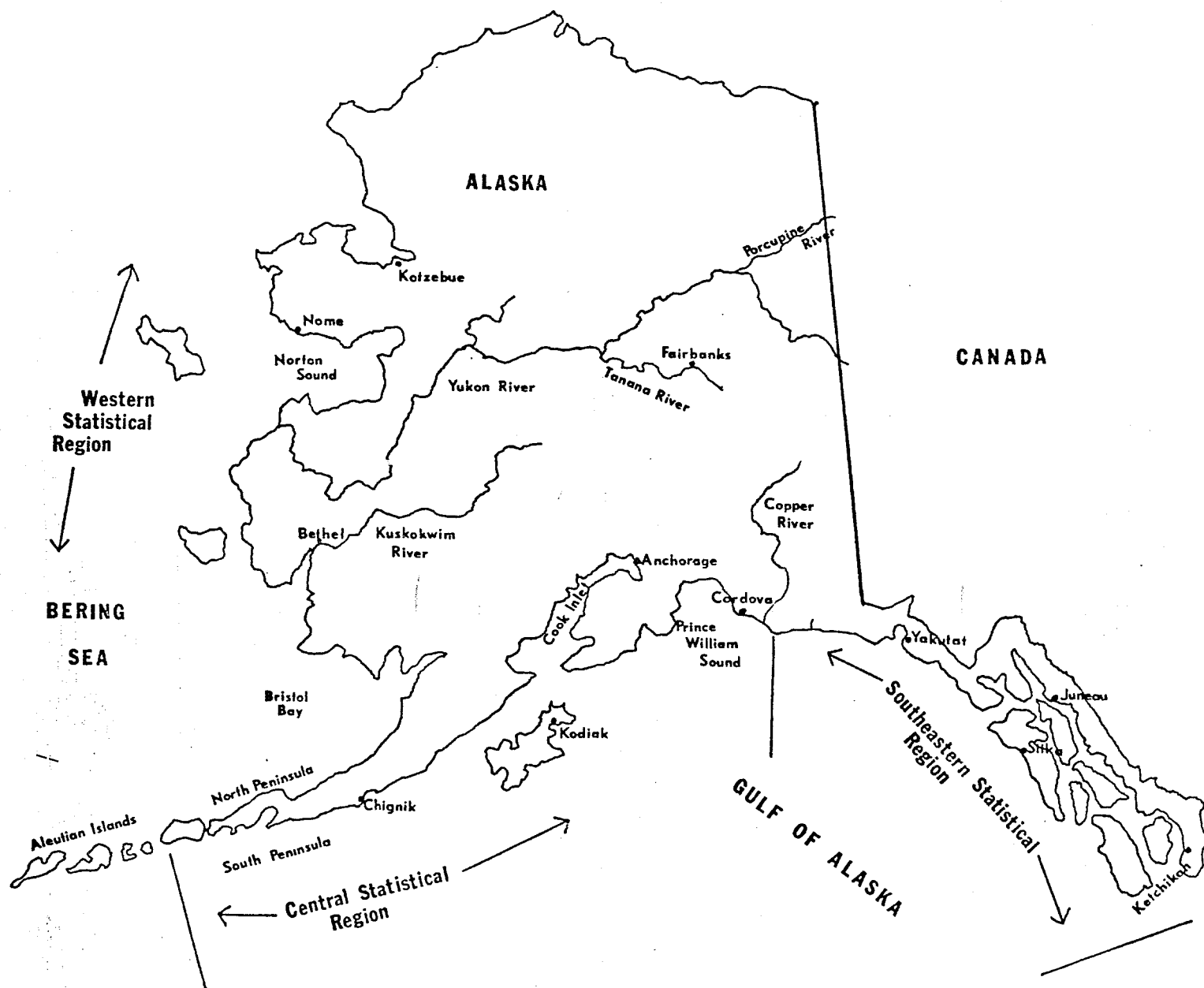


Figure 1. Alaska Department of Fish and Game Commercial Fisheries Statistical Regions.



## REVIEW OF THE 1981 SEASON

A preliminary estimate of the 1981 commercial salmon harvest in Alaska is 111.4 million fish, the seventh increase in an unbroken series begun in 1975. In most areas price agreements were reached before fisheries opened, and more surplus fish were taken than in 1980, when price disputes delayed fishing. The 1981 catch was the third largest in Alaska's history, nearly 50% larger than had been expected.

Statewide, commercial catches of all five salmon species surpassed projections; the only overestimates were chinook and chum salmon in Southeastern Alaska, and pink salmon in Western Alaska. The Southeastern chinook harvest was only slightly below that expected, and discrepancies in Southeastern chum and Western pink catches were less than 25% under projections. Detailed preliminary catch estimates are given in Table 3. Table 2 compares actual and forecast 1981 salmon returns for selected fisheries; ten of the 11 forecasts were below realized returns in 1981.

Table 2. Comparison of actual<sup>1</sup> and forecast 1981 salmon returns, with errors and relative errors, for some major Alaskan salmon fisheries.

Area	Species	Thousands of Fish					(6) Relative error: (5)/(3) X 100%
		(1) Harvest <sup>1</sup>	(2) Escapement	(3) Return <sup>1</sup> (1) + (2)	(4) Forecast return	(5) Error: (4) - (3)	
Southern Southeastern	Pink	12,700	5,880	18,580	14,600	-3,980	-21%
Northern Southeastern	Pink	4,740	3,580	8,320	6,800	-1,520	-18%
Southeastern Total	Pink	17,440	9,460	26,900	21,400	-5,500	-20%
Prince William Sound	Pink	20,150	3,100	23,250	13,000	-10,250	-44%
	Chum	1,870	205	2,075	660	-1,415	-68%
Cook Inlet-Southern and Outer Districts	Pink	3,200	500	3,700	3,000	-700	-19%
Kodiak	Pink	10,300	2,900	13,200	6,200	-7,000	-53%
Chignik	Sockeye <sup>2</sup>	2,220	830	3,050	1,700	-1,350	-44%
	Pink	1,130	600	1,730	1,900	170	10%
South Peninsula <sup>3</sup>	Pink	4,500	2,100	6,600	3,600	-3,000	-45%
Bristol Bay	Sockeye <sup>4</sup>	25,710	8,870	34,580	26,700	-7,880	-23%
	Pink <sup>5</sup>						
Kotzebue	Chum	680	330	1,010	340	-670	-66%
Total		87,200	28,895	116,095	78,500	-37,595	-32%

<sup>1</sup> Preliminary data, compiled November 23, 1981.

<sup>2</sup> The harvest includes estimated interceptions of Chignik-bound sockeye taken at Cape Igvak, Aniakchak, Hook Bay, and Stepovak Bay.

<sup>3</sup> The harvest does not include June catches of migrating pink salmon bound for other areas.

<sup>4</sup> Inshore harvest only.

<sup>5</sup> Pink salmon returns to Bristol Bay in odd-numbered years are negligible.

Table 3. Preliminary 1981 Alaska commercial salmon harvest by species and fishing area<sup>1</sup>.

(Thousands of Fish)

MANAGEMENT AREA	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southern Southeast						
District 1 gill net	1.6	133.2	23.8	667.1	64.5	890.2
Prince of Wales Island gill net	2.1	180.7	23.1	429.6	34.1	669.6
Stikine River gill net	.3	8.8	1.4	1.5	3.6	15.6
Southern districts seine	7.5	339.2	223.2	11,175.3	269.9	12,015.1
Annette Island trap & gear unspecified	1.0	15.9	4.4	230.8	3.9	256.0
Southern Southeast total	12.5	677.8	275.9	12,504.3	376.0	13,846.5
Northern Southeast						
Taku-Snettisham gill net	1.6	39.7	26.3	222.7	74.5	364.8
Lynn Canal gill net	1.3	93.0	42.4	137.5	90.0	364.2
Yakutat gill net	2.1	149.4	129.1	134.4	10.6	425.6
Northern districts seine	2.2	55.7	42.8	3,976.5	201.9	4,279.1
Northern Southeast total	7.2	337.8	240.6	4,471.1	377.0	5,433.7
Southeastern Region troll	247.0	7.6	860.9	576.0	9.0	1,700.5
SOUTHEASTERN STATISTICAL REGION TOTAL	266.7	1,023.2	1,377.4	17,551.4	762.0	20,980.7
Cordova area						
Copper River	20.8	487.0	303.8	23.8	1.8	837.2
Bering River	.2	56.0	76.2	10.2	8.5	151.1
Prince William Sound	.4	252.4	2.4	20,149.9	1,874.6	22,279.7
Cordova area total	21.4	795.4	382.4	20,183.9	1,884.9	23,268.0
Cook Inlet area						
Upper Cook Inlet						
Northern District	.8	249.5	133.1	53.3	46.1	482.8
Central District	10.8	1,193.8	361.0	74.6	796.8	2,437.0
Upper Cook Inlet total	11.6	1,443.3	494.1	127.9	842.9	2,919.8
Lower Cook Inlet						
Southern District	.3	78.8	8.2	1,473.8	24.1	1,585.2
Kamishak District	.0	4.5	1.8	53.4	60.1	119.8
Outer District	.1	17.8	.1	1,723.7	226.2	1,967.9
Eastern District		9.3	.5	49.9	3.2	62.9
Lower Cook Inlet total	.4	110.4	10.6	3,300.8	313.6	3,735.8
Cook Inlet area total	12.0	1,553.7	504.7	3,428.7	1,156.5	6,655.6
Kodiak Island	1.4	1,287.0	116.7	10,301.4	1,342.1	13,048.6
Chignik	2.7	1,836.6	77.1	1,130.0	575.4	3,621.8
South Peninsula	9.5	2,218.2	161.9	5,012.4	1,774.8	9,176.8
CENTRAL STATISTICAL REGION TOTAL	47.0	7,690.9	1,242.8	40,056.4	6,733.7	55,770.8
Bristol Bay						
Naknek-Kvichak District	10.0	10,949.0	1.0		348.0	11,308.0
Nushagak District	195.0	7,713.0	225.0		773.0	8,906.0
Egegik District	6.0	4,481.0	29.0		87.0	4,603.0
Ugashik District	4.0	1,950.0	18.0		34.0	2,006.0
Togiak District	24.0	621.0	30.0	7.0	236.0	918.0
Bristol Bay total	239.0	25,714.0	303.0	7.0	1,478.0	27,741.0
North Peninsula	17.9	1,827.2	156.7	10.5	708.2	2,720.5
Aleutian Islands		5.4	.2	302.8	6.6	315.0
Arctic-Yukon-Kuskokwim						
Kuskokwim area	79.4	105.9	279.6	.5	485.6	951.0
Yukon River						
Lower Yukon River	149.8		21.6		1,244.6	1,416.0
Upper Yukon River	9.1		2.8		393.0	404.9
Yukon River total	158.9		24.4		1,637.6	1,820.9
Norton Sound	7.9	.1	31.6	232.5	169.7	441.8
Kotzebue area	.1			.2	677.3	677.6
Arctic-Yukon-Kuskokwim total	246.3	106.0	335.6	233.2	2,970.2	3,891.3
WESTERN STATISTICAL REGION TOTAL	503.2	27,652.6	795.5	553.5	5,163.0	34,667.8
ALL ALASKA TOTAL	816.9	36,366.7	3,415.7	58,161.3	12,658.7	111,419.3

<sup>1</sup> Preliminary. Compiled November 23, 1981.

## Southeastern Alaska

Again in 1981, Southeastern Alaska pink salmon returns were stronger than expected, particularly middle and late runs harvested in District 3 and the outside portions of District 13. In northern Southeastern Alaska, the pink salmon catch of over 5 million fish was the largest since 1968, when nearly 10 million were taken. Sockeye catches were also larger than anticipated, with record gill net harvests in District 6. Taku, Snettisham, and Chilkat sockeye runs were below average. Although fishing time restrictions were imposed on the Noyes Island seine fishery, catches were large. Coho salmon runs appeared stronger than usual, and the troll coho harvest was better than average.

Chinook landings were about 8% below the projection. The troll fishery was closed in early July and in mid-August to avoid exceeding the guideline harvest level jointly established by the Board of Fisheries and the North Pacific Fishery Management Council. Chinook escapements in northern Southeastern Alaska were significantly improved, but were weak in southern spawning streams.

Chum salmon catches were below expected levels in most fisheries, but some early runs in northern Southeastern and the fall chum return to Excursion Inlet were strong. Fall chum returns to Lynn Canal were very weak.

## Cordova Area

Runs for all species far exceeded expectations and for the third consecutive year surpassed all previous records for pink salmon. A new record was also set for chum returns and the coho harvest was the largest in almost 40 years. The total commercial harvest of 23.3 million salmon exceeded the previous record set in 1979 by over 7 million fish. Escapements were optimum or above for all species including chum salmon. Chum escapements have been poor in recent years.

Copper and Bering River sockeye runs were markedly improved. Sockeye returns to both areas were from one to two weeks early and were much stronger than expected. Escapements to both upriver and delta systems were excellent and coho escapements were outstanding.

## Cook Inlet Area

Lower Cook Inlet pink salmon catches set a new record, 10% above the previous high of 3 million fish. Pink salmon returns to the Department hatchery at Tutka Lagoon exceeded 1 million, and catches in Nuka Bay and the Eastern District were phenomenally high. Excellent pink salmon escapements were achieved in all major spawning streams.

The Lower Cook Inlet chum salmon harvest of over 300,000 fish closely approached the record high and escapements ranged from good to excellent. The Lower Cook Inlet sockeye catch was also considerably better than average, with escapement goals being met in most systems. The Leisure Lake stocking project contributed nearly 10,000 sockeye to the harvest.

Overall, Upper Cook Inlet salmon catches were near average, but abnormal fish behavior, generally attributed to persistent high winds, resulted in an atypical catch distribution. Northern District set nets did very well, with a new record sockeye harvest, but catches in the Central District were below average. Sockeye escapement goals were reached in all rivers except the Crescent; returns to the Kasilof River were notably strong and early. The Upper Cook Inlet chum harvest was average, but the coho catch was the second highest in history.

#### Kodiak Area

Kodiak sockeye runs were early and strong; catches were above average and escapements were very good in most systems. Pink salmon returns were much better than expected, particularly to the west side of Kodiak Island. Coho and chum harvests were also excellent.

#### Chignik

Both early and late Chignik sockeye runs were large in 1981, with a total escapement of over 800,000. The harvest was nearly twice as high as had been expected. Chum returns were also substantial, with most of the record harvest occurring in the Western and Perryville Districts. Pink runs were close to forecast levels. Chinook and coho catches were significantly above average, and the total salmon harvest was the highest ever recorded.

#### Alaska Peninsula

South Peninsula pink salmon catches were late and below those in 1979 and 1980 but still much higher than usual. Escapement objectives were met. South Peninsula sockeye catches were also good. The Peninsula chum harvest was the largest since 1940, and escapements were good. Chinook, sockeye, coho, and chum returns to North Peninsula systems were all strong, providing large catches and good escapements. The North Peninsula coho catch was a record. Aleutian Island pink salmon runs were unusually strong for an odd-numbered year.

#### Bristol Bay

The Bristol Bay sockeye catch of 25.7 million established a new record, and escapement goals were achieved in all sockeye systems except the Kvichak River, where the 1.8 million escapement was only 200,000 fish short of the goal. Chinook harvests and escapements were the highest ever documented. Chum and coho runs were exceptionally strong as well.

#### Arctic-Yukon-Kuskokwim

Again in 1981, heavy returns of summer and fall chum salmon to most management units boosted the Arctic-Yukon-Kuskokwim commercial salmon harvest to a record high. Yukon and Kuskokwim chinook salmon runs were also exceptionally strong. Summer chum escapements to both Yukon and Kuskokwim spawning systems appeared excellent, and aerial surveys revealed very good chinook escapements to selected tributaries of the upper Yukon River. Reported Kuskokwim sockeye catches were up as a result of the Department's species identification program.

Chinook returns were average and chum runs were substantial in Norton Sound, and chum escapements in some critical areas were improved over recent years. In Kotzebue Sound, the commercial chum catch set a record; three times the most recent 5-year average. Noatak River chum escapement was excellent.

PRELIMINARY FORECASTS OF 1982 SALMON RETURNS TO  
SELECTED ALASKAN FISHERIES

The Department's salmon management program includes a number of salmon return forecast projects. Forecast fisheries are selected using several criteria, including economic importance, feasibility, compatability with existing programs, and management needs. Forecast fisheries are:

Southern Southeastern	-	pink salmon
Northern Southeastern	-	pink salmon
Prince William Sound	-	pink and chum salmon
Cook Inlet: Southern and Outer Districts	-	pink salmon
Kodiak	-	pink salmon
Chignik	-	pink and sockeye salmon
South Peninsula	-	pink salmon
Bristol Bay	-	pink and sockeye salmon
Kotzebue	-	chum salmon

In 1981 nearly 80% of the total statewide harvest was taken in these fisheries.

A variety of information is used to make salmon return forecasts, including escapement magnitudes and distribution, egg deposition, survival to intermediate life stages, environmental conditions, and population age composition. The return, with upper and lower limits, is predicted for each forecast fishery. In general, based on past experience, the actual return can be expected to fall within the range (between the lower and upper limits) about 50% of the time. In 1981, an exceptionally good year by any reckoning, only 3 of the 11 returns forecast were within their forecast ranges. Ten of the 11 forecasts were below realized returns in 1981. The 1982 forecasts and ranges are summarized in Table 4.

Southeastern Alaska Pink Salmon

Record pink salmon returns to the southern-most districts of Southeastern Alaska are anticipated in 1982. A mild winter and excellent parent-year escapements to Districts 1, 2, and 3 should provide most of the pink harvest in southern Southeastern Alaska, which is expected to exceed 20 million fish. Little if any harvestable surplus is looked for in the central Districts 5 through 8, where pink escapements have been poor and returns declining. Parent-year pink salmon escapements were also poor in northern areas, but

Table 4. Preliminary forecasts of salmon returns and commercial harvests for some major Alaskan fisheries in 1982.

(Thousands of Fish)

Area	Species	Forecast return	Escapement goal	Estimated harvest	Forecast <sup>1</sup> return range	Estimated harvest range
Southern Southeastern	Pink	27,800	6,000	21,800	22,800 - 32,800	16,800 - 26,800
Northern Southeastern	Pink	7,600	4,600	3,700	4,600 - 10,600	500 - 6,700
Southeastern Total	Pink	35,400	10,600	25,500	27,400 - 43,400	17,300 - 33,500
Prince William Sound Total	Pink	24,400	1,700	22,700	14,600 - 31,400	12,900 - 29,700
	Chum	1,700	250	1,450	1,400 - 2,000	1,200 - 1,800
Cook Inlet-Southern and Outer Districts	Pink	1,050	200	850	500 - 2,100	440 - 1,800
Kodiak	Pink	18,300	4,000	14,300	16,400 - 20,200	12,400 - 16,200
Chignik	Pink	1,500	700	800	1,000 - 2,000	300 - 1,300
	Sockeye <sup>2</sup>	2,600	650	1,950	2,100 - 3,100	1,400 - 2,400
South Peninsula <sup>3</sup>	Pink	6,700	2,000	4,700	5,600 - 7,800	3,600 - 5,800
Bristol Bay, Nushagak District	Pink	9,200	1,000	8,200		
Bristol Bay <sup>4</sup>	Sockeye	34,600	5,500	29,100	22,800 - 39,100	17,300 - 33,600
Kotzebue	Chum	610	190	390	400 - 700	250 - 450
TOTAL		136,060	26,790	109,940		

<sup>1</sup> The forecast return and harvest ranges are estimated by several techniques. Based on past experience, about half of the realized returns and harvests can be expected to fall within their respective ranges.

<sup>2</sup> Including estimated interceptions in Cape Igvak, Aniakchak, Hook Bay, and Stepovak Bay fisheries.

<sup>3</sup> Not including pink salmon taken in June near False Pass, South Unimak, and the Shumagin Islands, which are returning to other areas.

<sup>4</sup> Inshore harvest only.

environmental conditions were very good, and returns are expected to be large enough to support some harvest in most northern Southeastern districts.

#### Prince William Sound Pink and Chum Salmon

Good parent-year pink salmon escapements and very favorable environmental conditions are expected to lead to the largest Prince William Sound pink harvest in history. Strong returns to all management districts are anticipated. Private non-profit and Department hatcheries may contribute more than 6 million fish to the Prince William Sound pink catch. A very large chum salmon harvest is also expected.

#### Cook Inlet (Southern and Outer Districts) Pink Salmon

Severe fall and winter flooding in major producing systems in the Southern and Outer Districts of Lower Cook Inlet balanced against good escapements and warm spring and early summer weather suggest a reduced harvest of naturally produced pink salmon in 1982. Pink returns to the Department's Tutka Lagoon hatchery are expected to provide most of the anticipated 850,000-fish harvest.

#### Kodiak Pink Salmon

Although parent-year pink salmon escapements were excellent, overwinter survival was highly variable. However, consistently good marine survival during recent years suggests a better-than-average pink salmon return in 1982. The Kodiak area pink salmon catch should exceed 14 million fish.

#### Chignik Sockeye and Pink Salmon

A near-record Chignik sockeye harvest is forecast in 1982. Very strong early and late runs are expected. A good pink salmon catch is also expected, slightly below the 1981 catch.

#### South Peninsula Pink Salmon

South Peninsula pink salmon returns are forecast at levels close to those occurring in 1981, allowing an above-average harvest of nearly 5 million fish.

#### Bristol Bay Sockeye and Pink Salmon

Another record-breaking sockeye harvest is forecast in Bristol Bay for 1982. Although escapement goals are under review and may be increased, the harvest should still be exceptionally large. A very large pink salmon return to the Nushagak River is also envisioned, with an allowable harvest exceeding 8 million fish.

#### Kotzebue Chum Salmon

An above-average Kotzebue chum salmon return is forecast in 1982, which should permit a harvest of nearly 400,000 chums.



## PROJECTED 1982 ALASKAN COMMERCIAL SALMON HARVESTS

Projections of the 1982 Alaskan commercial salmon harvest by statistical region and species are presented in Table 5. The projections are composed of forecast harvests and harvest projections (recent harvest averages, sometimes modified if additional information is available), for fisheries without forecasts. Chinook and coho returns are not forecast in any region. Only Prince William Sound and Kotzebue have chum salmon forecasts. All regions have pink salmon forecasts, but several smaller pink runs are not forecast. Major sockeye runs in the Central and Western Regions are forecast; important exceptions are Copper River, Cook Inlet, and Kodiak. Despite these gaps, 78% of the 1981 salmon harvest of 111 million fish was taken in forecast fisheries.

Norton Sound pink salmon runs are expected to be extremely strong in 1982. However, Norton Sound pink runs are not formally forecast because run sizes are erratic, the fishery is small, and processing capacity is quite limited. While the Norton Sound pink return may be as high as 5 million fish, many of which will be surplus to escapement needs, this area's pink salmon contribution to the Western Region projected harvest in Table 5 below is less than 400,000 fish. Although this is only a small fraction of the possible pink return, it would be an exceptionally large pink salmon catch for Norton Sound.

Table 5. Preliminary projections of 1982 Alaskan commercial salmon harvests by statistical region and species.

Thousands of Fish

Statistical Region	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	280	1,000	1,100	25,500	1,300	29,180
Central	44	8,150	920	44,800	4,900	58,814
Western	408	30,670	725	10,500	4,700	47,003
TOTAL ALASKA	732	39,820	2,745	80,800	10,900	134,997

<sup>1</sup> Compiled October 21, 1981. The projected 1982 harvests were obtained by summing harvest forecasts (Table 4) and harvest projections in the remaining fisheries.

The 1982 statewide total commercial harvest projection is 135.0 million salmon.

### Species Outlook

#### Pink Salmon

60% of the 1982 statewide total harvest projection, or 81 million fish

52% of the 1981 statewide total harvest, or 58 million fish

Increased pink salmon returns are expected in all three statistical regions. Only slightly smaller pink harvests are anticipated in northern Southeastern Alaska, Lower Cook Inlet, Chignik, and the South Peninsula. Significant increases are anticipated in other areas. A statewide harvest of more than 77 million pink salmon would set a new record for this species.

#### Sockeye Salmon

29% of the 1982 statewide total harvest projection, or 40 million fish

33% of the 1981 statewide total harvest, or 36 million fish

Alaska sockeye harvests in 1982 should be quite similar to those obtained in 1981.

#### Chum Salmon

8% of the 1982 statewide total harvest projection, or 10 million fish

11% of the 1981 statewide total harvest, or 13 million fish

Moderate declines in chum salmon harvests are expected in central and western Alaska.

#### Coho Salmon

2% of the 1982 statewide total harvest projection, or 2.6 million fish

3% of the 1981 statewide total harvest, or 3.4 million fish

#### Chinook Salmon

1% of the 1982 statewide total harvest projection, or 710,000 fish

1% of the 1981 statewide total harvest, or 820,000 fish

Catches of coho and chinook salmon are not expected to differ much from those in 1981, although somewhat smaller harvests are projected.

## Regional Outlook

### Statewide

1982 statewide total harvest projection: 135.0 million fish

1981 statewide total harvest: 111.4 million fish

An 21% increase in the statewide salmon catch is projected, almost all due to larger expected pink salmon returns to all statistical regions. If this projection is realized, it will be the largest harvest in Alaska's history.

### Southeastern Region

22% of the 1982 statewide total harvest projection, or 29 million fish

19% of the 1981 statewide total harvest, or 21 million fish

An expected increase of more than 50% in Southeastern Alaska pink salmon catches accounts for the anticipated improvement in 1982.

### Central Region

43% of the 1982 statewide total harvest projection, or 59 million fish

50% of the 1981 statewide total harvest, or 56 million fish

No major changes are projected in 1982.

### Western Region

35% of the 1982 statewide total harvest projection, or 47 million fish

31% of the 1981 statewide total harvest, or 35 million fish

Most of the increase is due to the expected large Nushagak River pink salmon return, which occurs only in even-numbered years.

## DISCUSSION

Commercial salmon harvests in Alaska, displayed in Figure 2, have consistently increased since the 1974 statewide total catch of 22 million fish. During this period, Department projections have just as consistently fallen below realized catches. During the twelve years harvest projections have been published, relative error, as a percent of the actual harvest, has ranged from 33% low in 1981 to 46% high in 1972 (see Table 1). The 1982 harvest projection of 135 million salmon, even if 50% high, presages a much better than average catch. However, because this projection is larger than any other ever issued by the Department, and would, if realized, be the largest salmon harvest in Alaska's history, it should be interpreted with caution. Several of the individual forecasts on which the statewide harvest projection depends strongly are based on extrapolated relationships which may be optimistic.

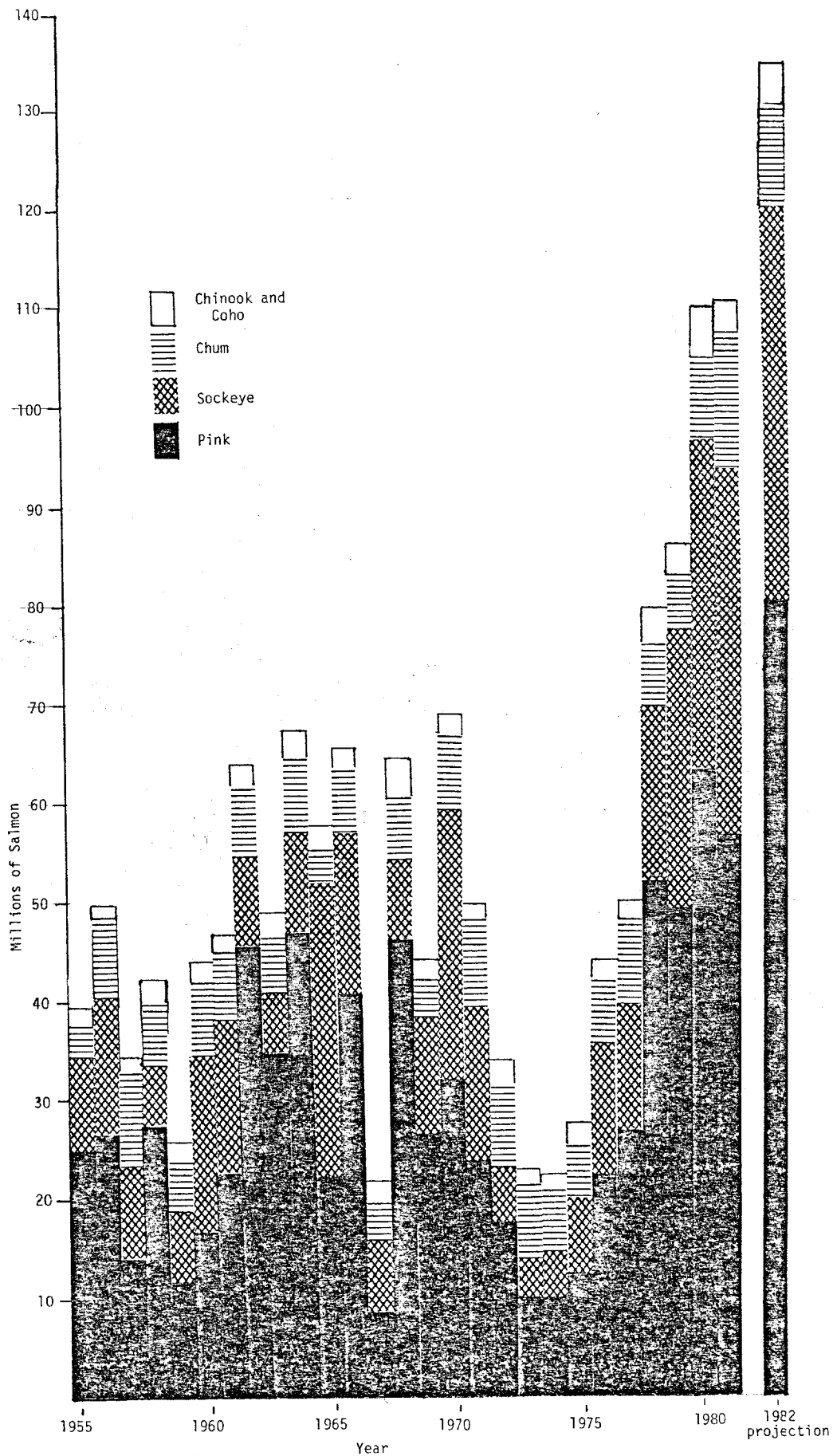


Figure 2. Alaskan commercial salmon harvests by species, 1955-1981, and the 1982 projected harvest.

## APPENDIX. FORECAST METHODS AND DISCUSSIONS

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

Southern Southeastern:	<u>Point</u>	<u>Range</u>
Return Estimate:	27.8 million	22.8 million to 32.8 million
Escapement Goal:	6.0 million	
Harvest Estimate:	21.8 million	16.8 million to 26.8 million
Northern Southeastern:		
Return Estimate	7.6 million	4.6 million to 10.6 million
Escapement Goal:	4.6 million	
Harvest Estimate:	3.7 million	500,000 to 6.7 million
Total Southeastern:		
Return Estimate:	35.4 million	27.4 million to 43.4 million
Escapement Goal:	10.6 million	
Harvest Estimate:	25.5 million	17.3 million to 33.5 million

### FORECAST METHODS

Separate forecasts are prepared for the pink salmon returns to northern and southern Southeastern Alaska due to the differences in migration routes and other population characteristics of the pink salmon returning to the two areas. The 1981 forecast for southern Southeastern was based primarily on a multiple regression analysis incorporating escapement and August, November-February, and spring air temperatures for several locations in southern Southeastern. The northern Southeastern forecast was based on a regression analysis with escapement, winter precipitation, and spring air temperatures. A number of forecast formulas were examined but none appeared as accurate as the ones used.

### DISCUSSION OF THE 1982 FORECAST

Southern Southeastern: The 1982 pink salmon return to southern Southeastern Alaska (Districts 1-8) is expected to be the largest since state-

hood. A mild winter with above-average sea water temperatures during the time of outmigration and excellent parent-year escapements in Districts 1, 2, and 3 are responsible for the optimistic outlook.

The escapement goal of 6 million for southern Southeastern Alaska was reached for the first time in 1980 (the parent year for the 1982 return). Escapements, however, were unevenly distributed. The escapement indices for Districts 1, 2, and 3 were slightly above their goals. The District 7 index was below the ten-year average, while Districts 5 and 6 had the lowest and second lowest escapements respectively of the ten-year period. Although survival in all districts was undoubtedly well above average, this disparity in escapements will probably result in the majority of excess fish returning to Districts 5-8 being intercepted outside of their home districts.

Using District 3 escapements to calculate return-per-index spawner ratios (R/S) to District 3 (including the catch in District 4) over the last four years gives an average R/S of over 4 to 1. Even this conservative estimate results in an estimated return to District 3 (including harvests in District 4) of over 10 million.

The return to District 1 should also be a record since statehood. The R/S to District 1 in 1978 (a year with survival conditions similar to those encountered by the 1982 fish) was 5.9 to 1. Using a more conservative R/S of 5 to 1 results in an estimated return to District 1 of over 11 million.

The return to District 2 is not as closely related to the overall return as the two areas discussed above. Consequently, any projections are very risky. However, the District 2 parent-year escapement was the largest since statehood, which, combined with high expected survival, could produce a return approaching that which occurred in 1978 of 6 million fish.

With few exceptions the returns to Districts 1, 2, and 3, and the harvest in District 4 have been building in recent years while those in Districts 5 through 8 have been declining. The decline in Districts 5 through 8 is generally disturbing in view of the above-average survival conditions in recent years. In order to insure a commercially viable population in Districts 5 through 8 escapements will have to be increased. The heavy fishing pressure which will be required to harvest the expected record return in Districts 1 through 4 will undoubtedly intercept a significant number of fish returning to Districts 5 through 8. Consequently, very little harvestable surplus is anticipated in Districts 5 through 8.

Northern Southeastern: Pink salmon returns to the inside districts are expected to be of sufficient strength to support harvest in most of the districts during the 1982 season. A parent-year escapement of 2.1 million fish for northern Southeastern was the poorest since 1976 with all districts falling well below escapement goals. Winter conditions, however, were excellent with January 1981 temperatures exceeding any in the past 21 years. The forecast formula used was the best available.

but there is a definite potential for the return to fall in the upper end of the forecast range. Spring air temperatures were at a record level in 1981 and in general environmental conditions were very promising for the 1982 return year.

The overall 1981 pre-emergent fry index was well above average with all inside districts except 14 having fry densities in excess of 100.0 fry per square meter. The highest fry values were in the District 9 area and in Peril Straits, both of which should support harvest in 1982.

District 9 had a particularly good fry index which exceeded any since the pre-emergent program was initiated in 1966. The study areas with the highest fry indices in District 9 were the areas along the western shore of Kuiu Island. The one study area on the Baranof Island side of District 9 had relatively few fry but lower Admiralty streams show good potential with high fry values in all study areas. Escapements were generally fair in District 9 averaging about 70% of the overall goal. Good harvest levels are expected from returns to this District.

In District 10 most of the return will be needed to meet escapement requirements but some harvest is likely. Pre-emergent fry indices were generally good with most study areas producing fair numbers of fry.

Pleasant Bay and Mole River in District 11 both had excellent fry indices from good parent-year escapements. In most other stream systems in Seymour Canal the parent-year escapements were below desired levels and no harvestable surplus is expected. Parent-year escapements were good in the Taku River area and the potential for returns to this area is high.

Most of the streams in the outside area of District 13 are not expected to produce returns in excess of escapement needs but chances are good for some localized harvests. In the Peril Straits area of District 13, returns are expected to produce some harvestable surplus. Pre-emergent fry values were very good in most locations, exceeding 150 fry per square meter in all but one study area.

District 12 is expected to produce harvestable returns from the Tenakee Inlet stocks and the potential for harvest from the Admiralty Island streams also looks promising. Early marine work in Tenakee Inlet recorded high numbers of fry and conditions for survival appeared good.

Doug Jones  
Fishery Biologist  
Juneau

Karl Hofmeister  
Fishery Biologist  
Ketchikan

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	17.6 million	11.7 million to 23.5 million
Escapement Goal:	1.5 million	
Harvest Estimate:	16.1 million	10.2 million to 22.0 million

SUPPLEMENTAL PRODUCTION

Return Estimate:	6.8 million	2.9 million to 7.9 million
Required Brood Stock:	180,000	
Hatchery Harvest Estimate:	825,000	
Common Property Harvest Estimate:	5.8 million	1.9 million to 6.9 million
Total Harvest Estimate:	6.6 million	2.7 million to 7.7 million

TOTAL PRODUCTION

Return Estimate:	24.4 million	14.6 million to 31.4 million
Escapement and Brood Stock:	1.7 million	
Harvest Estimate:	22.7 million	12.9 million to 29.7 million

FORECAST METHODS

Natural Production: The 1982 forecast is based on a multiple regression analysis of brood-year pre-emergent fry indices, the following year's daily average Prince William Sound March-April air temperatures, and the resulting adult returns. As for previous years, the 1980 brood-year pre-emergent fry index was determined from a standard list of streams and sample sites. The forecast is based on post-earthquake, even-numbered year data only.



The estimated escapement in 1980 was 1.6 million fish, and all management districts met or slightly exceeded their escapement goals. The result of this escapement, followed by a mild winter, was a record pre-emergent fry index of 496 fish per square meter. Following this, Prince William Sound experienced a warm spring, and a warm spring environment has tended to be a favorable influence on pink fry estuarine survival rates, leading to increased adult returns.

The forecast return range is an 80 percent confidence interval.

Supplemental Production: The 1982 return will be the result of Prince William Sound Aquaculture Corporation (PWSAC) and Alaska Department of Fish and Game fed and unfed fry releases. The PWSAC fry release was comprised of 2.8 million fed and 41 million unfed fry, while the Department release was 14.4 million unfed fry.

Adult return estimates were determined by estimated fry-to-adult low, mean, and high survival rates on fed and unfed fry as independently experienced for both hatchery facilities.

#### DISCUSSION OF THE 1982 FORECAST

Natural Production: The predicted return in 1982 of 17.6 million pink salmon is the largest in the history of Prince William Sound pink salmon forecasting. The 1981 forecast was the previous record.

The 1982 return should be strong to all management districts of the Sound. This means that all run segments should significantly contribute to the commercial catch. With a desired escapement level of 1.5 million fish, the catch should range from 10.2 million to 22 million with a mid-range estimate of 16.1 million. If the mid-range estimate is realized, it will be a new record harvest for Prince William Sound. The previous even-year record catch occurred in 1980 when 15.4 million pinks were taken.

Supplemental Production: With brood stock and hatchery sale fish requirements of 1.0 million fish, Prince William Sound's hatchery returns should contribute 6.6 million fish to the commercial harvest; range estimates for the catch are 2.7 million and 7.7 million fish. Returns bound for the Department facility should contribute to the catch from mid-July to early August, while PWSAC returns should make significant contributions from late July to mid-August.

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	1.7 million	1.4 million to 2.0 million
Escapement Goal:	250,000	
Harvest Estimate:	1.4 million	1.2 million to 1.8 million

FORECAST METHODS

The 1982 forecast is a combination of two statistical analyses. The first is a standard linear regression analysis of pre-emergent fry indices with subsequent adult returns. The second is also a linear regression analysis and involves the relationship of 4-year-old fish to 3-year-old fish production resulting from the same brood year.

The first method of analysis forecasts a total return of 1.4 million fish with a correlation of 0.52. The forecast range for this analysis is from 1.1 million to 1.7 million fish.

The second method, using 4-year-old and 3-year-old returns from the same brood year, indicates a total return of 2.0 million with a correlation of 0.98. This analysis is based on brood years 1966 through 1977; years for which all 3-year-old and 4-year-old returns are available, excluding brood years 1969, 1972, and 1974. These years were excluded due to very high 4-year-old to 3-year-old ratios: 3-year-old production was quite low, while 4-year-old production was average or high. The 4-year-old to 3-year-old ratios for the excluded years are 48.5, 32.6, and 20.1, respectively. The remaining years, which were used in the analysis, had ratios ranging from 5.0 to 12.1. Because the excluded years had very high ratios, the resulting forecast return is smaller than it would be if all years were included.

In the last two return years, 1980 and 1981, Prince William Sound has experienced large returns of 3-year-old chums. Results of scale aging for 1980 showed a total of 250,000 3-year-old fish; this was followed in 1981 by a return of 1.8 million 4-year-olds. The 1981 return had an estimated 210,000 3-year-old fish, again indicating a strong 4-year-old return in 1982.

DISCUSSION OF THE 1982 FORECAST

The vast majority of the 1982 chum return will be heading for streams located in the Eastern, Northern, Coghill, and Northwestern management

districts; of these returns, the Eastern District will be the major contributor. The Southeastern District will also make a minor contribution. Harvestable surpluses will be mostly from middle-run streams with smaller surpluses coming from early- and late-run streams.

As in 1980, the 1981 return contained a large number of 3-year-old fish. Therefore, it is expected that the 1982 return will contain large numbers of 4-year-old fish. Environmental conditions that have encouraged these high production rates are persisting, and another strong return of 3-year-olds is anticipated in 1982.

Both PWSAC and Department hatcheries expect a few returning chum salmon in 1982, but the numbers are negligible in comparison to anticipated natural returns.

Michael L. McCurdy  
Fisheries Research Biologist  
Cordova

FORECAST AREA: Cook Inlet, Southern and Outer Districts

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	410,000	100,000 to 1.3 million
Escapement Goal:	170,000	
Harvest Estimate:	240,000	20,000 to 970,000

SUPPLEMENTAL PRODUCTION

Return Estimate:	640,000	450,000 to 830,000
Required Brood Stock:	30,000	
Harvest Estimate:	610,000	420,000 to 800,000

TOTAL PRODUCTION

Return Estimate:	1,050,000	550,000 to 2.1 million
Escapement and Brood Stock:	200,000	
Harvest Estimate:	850,000	440,000 to 1.8 million

FORECAST METHODS

The 1982 pink salmon forecast for the Southern and Outer Districts of Cook Inlet is derived from a linear regression between indices of pre-emergent fry densities in nine major spawning streams and the subsequent adult returns. Pre-emergent fry abundance is determined from these streams each spring, and the index for each stream is weighted by the average escapement for that stream. The resultant individual stream indices are combined to yield a single, weighted pre-emergent fry index for all nine streams.

The Fisheries Rehabilitation, Enhancement, and Development Division Tutka Lagoon pink salmon hatchery has contributed significantly to the Southern District pink salmon return, providing from 35% to 70% of the District's catch since 1978. The hatchery released 8.5 million short-term reared fry and 1.4 million unfed fry into Tutka Bay in 1981. Survival rates for reared fry have ranged between 5% and 16%, and from 2% to 7% for unfed fry. While 1981 spring planktonic food levels were higher than in 1980, there may be a difference in even- and odd-numbered year survival rates at similar plankton levels. While this phenomenon

has not been verified or explained, it seems probable that survival of 1981 reared fry will be less than the 16% estimate for the 1980 release.

#### DISCUSSION OF THE 1982 FORECAST

The 1980 pink salmon escapement of 260,000 was the second highest even-year escapement on record since 1964. However, severe flooding in most major producing systems throughout the fall and winter of 1980 and 1981, respectively, resulted in the lowest pink salmon fry densities since 1967. Four separate forecasts were calculated. The first two were pre-emergent fry density regressions using all years and even-numbered years data, respectively, giving return estimates of 20,000 and 410,000 fish. The third and fourth forecasts used return per spawner data. The average return per spawner of 4.7 yielded an estimate of 1.2 million while the 1967 return per spawner of 1.9 yielded an estimate of 510,000.

The first and third forecasts appear unreasonable. The second and fourth forecasts of 410,000 and 510,000 are fairly close and more accurately reflect the potential 1982 natural return. The majority of the return should occur to Windy and Port Dick Bays and the East Arm of Nuka Bay. Port Graham and Seldovia Bays should have slightly below average returns. Spring and early summer weather was excellent, and plankton production was high based on the Tutka Bay monitoring program. It is possible that these factors will boost survival rates with a return considerably above the mid-point estimate.

Thomas R. Schroeder  
Area Biologist  
Homer

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	17.6 million	15.9 million to 19.4 million
Escapement Goal:	3.9 million	
Harvest Estimate:	13.7 million	12.0 million to 15.5 million

SUPPLEMENTAL PRODUCTION

Return Estimate:	660,000	540,000 to 790,000
Required Brood Stock:	90,000	
Harvest Estimate:	570,000	450,000 to 700,000

TOTAL PRODUCTION

Return Estimate:	18.3 million	16.4 million to 20.2 million
Escapement and Brood Stock:	4.0 million	
Harvest Estimate:	14.3 million	12.4 million to 16.2 million

FORECAST METHODS

The 1982 pink salmon return forecast to the Kodiak management area was determined as follows: A point estimate for the Kodiak-Afognak Island complex was calculated from a multiple regression of the past 16 years pink salmon returns with pre-emergent fry density, escapement, and mean March, April, and May air temperatures. An estimate for the Mainland District return was then added to this to bring the total return point estimate to 17.6 million. A practical spread of 3.5 million was used for the range estimate of 15.9 to 19.4 million. The Mainland District's return was calculated from the average of estimates from the ratio of the return per spawner which occurred in the 1980 brood year to the 1982 brood year escapement and the fry density-return ratios of the 1978 and 1980 returns.

DISCUSSION OF THE 1982 FORECAST

Pre-emergent fry sampling this spring indicated very spotty overwinter survival from the excellent brood year escapement in 1980. Sampling resulted in an unweighted fry index of 130 live fry per square meter,

55% below the index of 235 which resulted in 1980's excellent return.

Distribution of a record brood-year escapement resulted in nearly 90% of the fish entering pre-emergent index streams. Because of the wide variation in fry densities, warm spring temperatures, and what appears to be excellent marine survival during the past few years, the 1982 forecast is somewhat higher than would normally be expected from an overall density of 130 fry per square meter.

In 1982, from 16.4 to 20.2 million pink salmon are expected to return to the Kodiak management area. With a desired escapement goal of 4.0 million, a harvest of 12.4 to 16.2 million pinks is expected.

A breakdown of the expected return by major geographical districts is summarized below. All district catch projections are contingent on the fulfillment of escapement requirements.

Afognak District: Pre-emergent fry densities were slightly below the average for even-year returns. Due to very good environmental conditions a total return of 1.3 million pinks is expected. The desired escapement level is 250,000; therefore, a harvest of approximately 1 million naturally produced pinks is expected.

Supplemental production from the Kitoi Bay hatchery is expected to result in a total return of approximately 540,000 to 790,000 pinks from the 26.2 million fry released in the spring of 1981. Hatchery brood stock requirements are approximately 90,000 fish leaving 450,000 to 700,000 pinks available for harvesting.

Westside District: Overall fry density for this district was below average. Terror River and Uyak #202 both had fry densities of zero. But because of the excellent densities in Red River and high escapements into Red and Karluk Rivers the total return to the district is expected to be 11.2 million pinks. The desired escapement level is 2.2 million which would leave approximately 8.9 million pinks available for harvesting.

Alitak District: Fry density for this district was considerably below the even-year average. The Deadman River fry index was zero and Dog Salmon River had a very low density compared to past years. Humpy River should be the major producer in 1982. Fishing at Cape Alitak may be limited in order to assure proper escapements into Deadman and Dog Salmon Rivers. This District's desired escapement level is 500,000 pinks which would leave 1.4 million pinks available for harvesting.

General District: Pre-emergent fry density was below the even-year average. Once again fry indexes varied between poor to excellent within this district. Seven Rivers and the Buskin River should be the major producers. The desired escapement level for this district is 500,000 pinks which would leave 1.8 million pinks available for harvesting.

Mainland District: Pre-emergent fry survival ranged from poor to excellent. Taking into account this District's excellent brood year

escapement, 1.0 million pinks are expected for the total return. The desired escapement for the District is 400,000 pinks, leaving an estimated 600,000 pinks available for harvesting.

David Prokopowich,  
Assistant Area Management Biologist  
Kodiak



FORECAST AREA: Chignik

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	2.6 million	2.1 million to 3.1 million
Escapement Goal:	650,000	
Harvest Estimate:	1.9 million	1.4 million to 2.4 million

FORECAST METHODS

For the early run a linear regression predicting the number of three-year-old fish (two years in salt water) from the number of two-year-olds returning in 1981 was used. This linear relationship included all data from 1950 through 1981.

For the late run, average return per spawner data and pre-emergent fry densities were used. There appears to be no correlation between various age classes returning.

DISCUSSION OF THE 1982 FORECAST

Early Run: A standard linear regression was utilized to estimate the number of three-year-olds (two years in salt water) from two-year-olds returning in 1981. A return of 1.2 million is expected. The commercial harvest is expected to be approximately 830,000 with a minimum escapement of 400,000. The total early run range is 1.0 million to 1.5 million, with a mid-point estimate of 1.2 million.

Late Run: Because there appears to be no correlation between the various age classes returning for either the late run or the total run, average return per spawner (5.0) and pre-emergent fry density data were used. The predicted late run return for 1982 is 1.4 million with a normal escapement goal of 250,000. The total late run range is from 1.1 million to 1.6 million. The late run commercial harvest is expected to approximate 1.1 million.

Larry Nicholson  
Chignik Area Management Biologist  
Kodiak

FORECAST AREA: Chignik

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	1.5 million	1.0 million to 2.0 million
Escapement Goal:	700,000	
Harvest Estimate:	800,000	300,000 to 1.3 million

FORECAST METHODS

The 1982 pink salmon return to the Chignik management area was estimated from a linear regression of returns with pre-emergent index densities and average return per spawner as well as average total return by district and total area.

Linear regression analysis of stream pre-emergent fry densities was used to derive a point estimate for the Perryville and Western Districts. The Central, Eastern, and Chignik Bay Districts were combined and a forecast return developed by average return per spawner for 1974 through 1981. Range estimates for districts and total area were determined through both average total returns and return per spawner with the upper portion of the range derived from the more recent year's average.

DISCUSSION OF THE 1982 FORECAST

In the Chignik area pre-emergent stream index density data has not been independently accurate in predictions of total returns. Only in the Perryville and Western Districts has sampling been standardized enough to provide a workable data base. Pre-emergent sampling in the Central, Eastern, and Chignik Bay Districts has not been consistent in yearly sampling of representative index streams. In 1981, as well as in most years, a total of 10 index streams were sampled; two in the Perryville district, four in the Western District and four in the Eastern and Central Districts combined.

The brood year escapement for the 1982 return was 742,000 with 10 and 19 percent respectively to the Perryville and Western Districts, and 71 percent to the Eastern, Central, and Chignik Bay Districts combined. The Perryville and Western Districts are expected to get 27% of the total 1982 return. The Eastern, Central, and Chignik Bay Districts should receive the remaining 73%. At this time pre-emergent densities cannot be relied upon to accurately estimate total returns, but they are used as indicators of winter survival and in determining return ranges.

The 1982 point estimate is calculated as: Perryville District 130,000, Western District 280,000 and the Eastern, Central, and Chignik Bay Districts combined 1.1 million. The total area point estimate is 1.5 million with a range of from 1.0 to 2.0 million. With a total escapement goal of 700,000 the harvest should range from 300,000 to 1.3 million with a point estimate of 800,000 pink salmon.

Tyler Gilmer  
Assistant Area Management Biologist  
Peninsula/Aleutians Area  
Kodiak

FORECAST AREA: South Peninsula

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	6.7 million	5.6 million to 7.8 million
Escapement Goal:	2.0 million	
Harvest Estimate:	4.7 million	3.6 million to 5.8 million

FORECAST METHODS

The 1982 pink salmon forecast return to the South Peninsula was estimated by using both stream index pre-emergent fry densities and average return per spawner data. Linear regression for the years 1978 through 1981 was used to determine a point estimate. A regression for all years of sampling (1975 through 1981) was used to determine the low end of the range. The upper end of the range was calculated by the average return per spawner for 1979 through 1981.

DISCUSSION OF THE 1982 FORECAST

The South Peninsula pre-emergent program was initiated in 1975. A standard sampling scheme, technique, index streams and personnel have resulted in a firm data base that can be effectively utilized in forecasting. Information available for the years 1978 through 1981 is felt to be the most accurate and thus more weight is given to it than data from earlier years.

Numerous index streams are sampled and many are still being incorporated into the program. The 1982 forecast is based on a set of streams which have been consistently sampled. Streams for which only a limited data base is available are considered as indicators of run strength; however, their data points will not be used in the forecast calculations until a more complete data series is available.

Pre-emergent fry sampling in the spring of 1981 (the brood year for the 1982 return) in the key index streams produced an average density of 8.78 fry per square meter, compared to the 1980 average of 8.68. With similar escapements for both years it is felt the 1982 return will be very close to the 1981 return.

In 1982 from 5.6 to 7.8 million pink salmon are expected to return. It is strongly felt that the point estimate of 6.7 million will be close to the actual return. The desired escapement goal of 2.0 million would result in a harvest of 3.6 to 5.8 million with a point estimate

of 4.7 million pink salmon. This estimate does not include the June harvest of migratory pink salmon.

Tyler R. Gilmer  
Assistant Area Management Biologist  
Peninsula/Aleutians Area  
Kodiak

FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	34.6 million	22.8 million to 39.1 million
Escapement Goal:	5.5 million	(may be increased significantly)
Harvest Estimate:	29.1 million	17.3 million to 33.6 million (subject to change in escapement goals)

#### FORECAST METHODS

Most Bristol Bay sockeye salmon mature 4 to 6 years from the time of parental spawning. The run in 1982 will, therefore, be the progeny of the escapements of 1976, 1977, and 1978. The total Bristol Bay forecast is the sum of the forecasts of individual river system returns, each based on one or more of the following methods.

- (1) Escapement-return relationships, based on historical data, provide estimates of total production from each brood-year escapement. Average marine maturity schedules are then applied to estimate the numbers of adult salmon returning each year.
- (2) On the Kvichak and Wood Rivers, numbers of smolt migrating to the ocean are estimated annually. The return of adult salmon each year is estimated using these smolt counts, past survival data and average maturity schedules. Environmental data are also considered in estimating Kvichak smolt survival.
- (3) For each river system, relationships between the number of adult fish returning a year earlier and the number of adult fish from the same parent escapement and fresh water age group that return the following year are utilized.

#### DISCUSSION OF THE 1982 FORECAST

The 1982 Bristol Bay sockeye salmon return forecast is 34.6 million. Escapement requirements, which may be increased for Bristol Bay in 1982, total 5.5 million sockeye salmon. This suggests a potential harvestable surplus of 29.1 million; less if escapement goals are increased. Point estimates of allowable harvest by district in descending order of magnitude are: Naknek-Kvichak 14.5 million, Nushagak 8.6 million, Egegik 3.6 million, Ugashik 1.6 million, and Togiak 840,000.

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

Point

Return Estimate: 9.2 million

Escapement Goal: 1.0 million

Harvest Estimate: 8.2 million

DISCUSSION OF THE 1982 FORECAST

The 1982 forecast considered spring temperatures, fall water levels, and the number of spawners in the parent year (1980). Pink salmon forecasts for the Nushagak River are still highly speculative, and available information is not sufficient to determine return and harvest estimate ranges. Spring temperatures in 1981 were the warmest ever observed.

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Fisheries Research Biologist  
Anchorage

FORECAST AREA: Kotzebue

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1982 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	610,000	400,000 to 700,000
Minimum Escapement Goal:	190,000	
Commercial Harvest Estimate:	390,000	250,000 to 450,000
Subsistence Harvest Estimate:	30,000	
Total Harvest Estimate:	420,000	

FORECAST METHODS

The Kotzebue forecast of adult chum salmon returns is based on egg to adult survival rates and the assumption that brood survival will be reflected equally in all return years. For example, high survival of three-year-old fish in 1980 would indicate a correspondingly high survival of 4- and 5-year-old fish in 1981 and 1982, respectively, with all fish produced from the 1977 brood.

Survival rates were determined by estimating the number of eggs deposited each year by spawning chum salmon. To do this the following parameters were estimated: 1) Total escapement, 2) percent composition by sex, 3) percent composition by age for females, 4) mean fecundity by age group, and 5) total return. Survival rates were calculated by comparing total return for each age group within a brood to the number of eggs deposited in that brood year. For example, in 1977 there were approximately 145 million eggs deposited in all spawning areas. Returns for the 3- and 4-year-old groups from that egg deposition were 84,000 and 664,000, respectively. The survival rate is calculated by dividing these estimates by the egg deposition.

Survival rates for 3-year-old fish from each brood year are highly correlated to the survival rates of 4-year-old fish from the same brood years. This relationship allows the calculation of the 1982 4-year-old group return from the known 1981 3-year-old group survival rate. The same method is used to derive 5-year-old group returns from 4-year-old group survival rates. An estimate of 3-year-old group returns is taken as the mean survival for that age group.

DISCUSSION OF THE 1982 FORECAST

With a 15-year data base the relationships appear quite good with correlations greater than 0.90 for the 3 versus 4 and the 4 versus



5-year-old group regressions. The projected 1982 chum salmon return of 610,000 is expected to be the sixth largest since 1962. The components of this return are 4% 3-year-old fish, 39% 4-year-old fish, and 57% 5-year-old fish. The 5-year-old component is the second highest return of that age class since 1962 and is the last age group to reflect the high survival rates of the 1977 brood.

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Fishery Biologist  
Kotzebue

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